

VIEW OF THE RESULTS THUS FAR OBTAINED ARE  
BY THE USE OF ABSORBABLE PLATES IN  
EFFECTING VISCERAL APPROXIMATION.

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**S**EVEN years have passed since the first operation of Professor Senn, of intestinal anastomosis with absorbable plates.

The efforts of Jessett have widely introduced the method in England. But in spite of the brilliant operation of Von Baraçz and his long experimentation and enthusiastic support of this operation, the use of absorbable plates has made little progress on the continent of Europe.

During a recent residence in Paris I sought the reason for this neglect, and concluded that the predominating influence of Billroth and his assistants was sufficient to keep the attention of German surgeons fixed on methods of suture. In France the remarkable skill of Terrier in the use of sutures served also to keep the attention of French surgeons away from other methods. Moreover, Senn's method was unfavorably criticised by a young French surgeon who, without experimentation of any value, did not hesitate to pronounce against the method for reasons so futile that one cannot understand their acceptance by his readers. With the exception of Pierre Delbet, I know of no surgeon in Paris who has experimented with Senn's plates.

Von Baraçz had published for German readers the experimentation and technique of the use of absorbable plates. Mayo Robson and Chalot furnished sufficient technical direction for French readers. That which seemed lacking in the medical literature of this subject, was a critical study of Senn's method with special attention to its clinical results and their exposition

in a brief and forcible way. This was the object of my inaugural thesis at Paris, and it needed only the support given by Professor Terrier to bring Senn's method into notice there.

Since the publication of that monograph, several other cases have come to my knowledge. A recent statistical table, published by Dr. Murphy in the *Medical Record*, is incomplete and fails to present to the public the real status of Senn's method. These facts, and another that the preceding study was in French, in book-form, and not in circulation, led me to think that it might be interesting to publish this review of the clinical results of intestinal anastomosis with absorbable plates. The *ANNALS OF SURGERY* gave us Senn's method in 1888, and it seems fitting that its results be given in the same publication.

Since 1887 the reports of eighty-seven operations have been found. The plates have been modified by Mayo Robson, by the insertion of a decalcified bone tube to keep open the incision of the gut. Von Baraçz, Heigl, and Butz, following the suggestion of Dawbarn for a vegetable plate, have operated with plates of raw turnip, but all of these modifications retain the fundamental principle of Senn, to use for anastomosis two plane surfaces which, inserted by the incisions of the intestine, would keep in contact the serous surfaces until their adhesion be assured, when the plates would be absorbed by digestive processes. All cases operated by such means should be considered as included by Senn's method. Catgut (no plane surfaces), rubber, etc. (not absorbable), cannot be included in this study, for they violate one head or the other of Senn's fundamental idea.

Some modifications in size and material of the plates and certain differences in operating may justify a brief technical description of plates and method.

#### ABSORBABLE PLATES.

Two substances seem to be well adapted for this purpose,—*i.e.*, decalcified bone and raw turnip. The bone-plates are well known and experimented, their only objection is the time required for their preparation, for few dealers keep them on hand. Raw turnip seems to give as good results; plates can be instantly made

from this material, and are more pliable than bone, easier to preserve, and better brought together in making the anastomosis, slipping much less. The making of both will be described.

*Decalcified Bone Plates* (Senn).—The compact tissue of a large beef bone is cut into oval plates 7 centimetres long, 3 centimetres wide, and 5 millimetres thick. These are put into a 10-per-cent. solution of hydrochloric acid for decalcification, solution changed every twenty-four hours until the plates can be bent in all directions without fracturing, wash in a potash solution to remove excess of acid. With a knife make an elliptical opening in the centre 3 centimetres long, 7.5 millimetres wide. At each extremity and in the middle of each side punch a hole in the bone near the internal orifice. A needle threaded with a double thread of silk is passed through the hole at one extremity and brought out through the hole at one side. One end of the thread is withdrawn from the first hole and passed through the hole at the other end. A repetition of this process for the other side of the plate gives a double thread from each hole, the laterals armed with needles. A second plate like the first completes the necessary pair. Preserve in a solution of equal parts of alcohol, glycerine, and water.

*Vegetable Plates—Turnip* (Von Baraçz).—With a broad knife cut slices of raw turnip 5 millimetres thick. Shape out elliptical plates 7.5 centimetres long, 3.5 centimetres wide, and cut an internal opening 3 centimetres long, 7.5 millimetres wide. Punch holes, and pass the threads in the way described for the bone plates. Preserve as long as desired in a 1-per-cent. solution of carbolic acid, which hardens the plates a little.

*Instruments*.—The instruments necessary for an abdominal incision: a needle for intestinal suture, compression forceps, or elastic bands, if the operator does not prefer to use gauze strips or the fingers of an aid to isolate the intestine.

*The Patient*.—By far the greater number of patients operated by Senn's method were forced to gastro-enterostomy to alleviate pyloric stenosis. Most writers recommend the preparation of the patient several days before the operation, milk diet, rectal feeding, washing of the stomach morning and evening with an antiseptic

solution, etc. It is our opinion, confirmed by the experience of others as well as our own, that this period of preparation should be short. Washing of the stomach, rectal feeding, the vomiting which persists in spite of milk diet and washing, all of these enfeebling elements could be eliminated by immediate operation, which, establishing the permeability of the digestive tract, puts the patient in the best condition for recovery. *The preparation of the patient should be limited to the precautions necessary for abdominal incision, in all cases where time is to be considered.*

*Anæsthesia.*—The choice of an anæsthetic is important, all vomiting during the anæsthesia should be avoided, the length of the operation and the condition of the patient should enter into account.

Ether is liable to allow vomiting. Chloroform tends to prolong the post-operative period which precedes the awakening. The depressed condition of the patient indicates particularly the mixed method, ethyl bromide followed by chloroform, which stimulates the patient, assures an anæsthesia free from vomiting, a rapid return to consciousness, necessitating the absorption of only small quantities of the toxic agent.

A reference to the recent contributions to the literature of this subject will show to what extent post-operative vomiting is suppressed by this method of rapid anæsthesia.

*Operation.*—A gastro-enterostomy will be described, as this operation has been more frequently done than any other with absorbable plates, and its description will be sufficient to render any intestinal anastomosis easily understood.

The unconscious patient placed upon the table, the asepsis of the site of operation is assured by toilet and sterilized towels. Incision on the median line between the ensiform cartilage and the umbilicus, to be carried farther down according to the indications of the case or the habit of the operator. The peritoneum opened after complete haemostasis, the right hand introduced into the abdomen explores the region and determines the nature of the operation. Gastro-enterostomy decided upon, push to the right the omentum and small intestine, the right hand profoundly introduced searches the origin of the jejunum at its fixed point

to the left of the spinal column, descending slightly on the jejunum, a coil of it is thus made and brought around the left border of the omentum. Empty the coil of its contents by gentle pressure with the fingers, assuring a length of fifteen centimetres against any reflux of intestinal contents (clamps, bands, or fingers of an aid).

Surround the parts with sterilized towels, and incise the bowel opposite its mesentery insertion longitudinally of sufficient length to admit, when slightly stretched, the smaller diameter of the plate (three centimetres). Introduce the plate by sliding gently. Pass the needles of the lateral threads through all of the intestinal coats, passing from within the bowel to the outside near the edge of the incision, half-way from its extremities. Bring the terminal threads into the angles of the incision. Cover all with a sterilized towel and pass it to the aid to hold in the inferior part of the abdominal wound. Bring the stomach, more or less dilated, into the incision of the abdomen, surround with sterilized towels, cut into the anterior wall of the stomach, making an incision three centimetres long parallel to the inferior border at a few centimetres distance, terminating the incision near the pylorus, at least five centimetres from any malignant growth. If necessary empty the stomach of its contents by this incision (aspiration might be preferred). A running thread of fine catgut stitched over the edges of the incision serves to prevent a hernia of the mucosa, and stop any bleeding which frequently accompanies it. Slide the plate into this, *using no force*. Pass the threads as before, scarify lightly the serous surfaces. Complete the toilet of the parts, making sure that the peristaltic action of the intestine corresponds with the muscular contraction of the stomach, bring the plates together, tie the posterior threads, the terminals and the anterior last, drawing each knot sufficiently to maintain the contact complete, without interfering with the circulation; the thread ends cut close to the knots, be sure that the edges of the intestinal wound are entirely concealed between the plates where the knots themselves should be pushed with a director. Supplementary sutures are rarely necessary, but serve to prevent slipping of the plates, and assure the surgeon who makes his first

acquaintance with the method. Consequently some sero-serous sutures may be placed around the edges of the coapted plates, from three to six with fine silk are mentioned in the reported cases.

The approximation is complete. Let the parts drop into place after their toilet, remove all towels, and close the abdomen, sewing the peritoneum with lock-stitches of fine silk, the muscular sheath with a running silk thread, the skin with single stitches of silkworm gut. Dress with an aseptic towel, covered with sterilized cotton, slightly compressed with a flannel bandage.

The patient should have already awakened, and a rapid reaction against shock is to be desired.

*Post-operative Treatment.*—Avoid narcotics, sustain the patient by rectal feeding, stimulants per rectum if necessary. Senn recommends feeding liquids by the mouth after forty-eight hours; simple nourishment at the end of a week. His precaution to keep the patient in bed a month will not be necessary if the abdomen is closed as directed. Hundreds of laparotomies terminated by Professor Terrier in this way have shown no tendency to ventral hernia.

It is our opinion that great importance should be given to prompt feeding by the mouth, the more so that no accident of this origin is found in any of the reported cases, and several of the surgeons express their conviction that the death of their patient was due to insufficient alimentation, and might have been avoided by prompt feeding. Other surgeons confirm by their successes the immense advantage of rapid nourishment in the normal condition. It should be remembered that the stomach has lost much of its digestive power, and can only handle small quantities at a time, but frequently administered. A little care will avoid any over-feeding and consequent trouble of indigestion.

*Mortality Statistics.*—The general mortality of eighty-seven operations by Senn's method is 23.10 per cent.

Sixty-one gastro-enterostomies give 14 deaths, a mortality of 22.95 per cent., about the same as the general mortality. Sixty-

one operations by 34 different surgeons, 5 successes without details. Fifty-eight gastro-enterostomies for cancer of the pylorus, and 3 for non-malignant stenosis. Eighteen cases of gastro-enterostomy, the patient a female, resulted fatally only twice, a mortality of only 11.11 per cent. Remark: this female mortality is less than one-half of the mortality of the operation.

The youngest patient operated was twenty years old, and the oldest patient seventy-one, both males.

*Deaths.*—Of the fourteen deaths, one is reported by Jessett without details. A woman, fifty-three years old, operated in January, 1893, for cancer of the pylorus. Five deaths followed the operation in from two to twenty-five hours time. Once from intense shock, fatal result five hours after operation, the *post-mortem* showed the perfect condition of the anastomosis, the adhesion already so firm that considerable hydraulic pressure failed to produce a leak.

Four deaths, at two, eight, twelve, and twenty-five hours that followed the operation, are the result of cases operated *in extremis*, the fatal termination to have been expected.

Six deaths occurred between the third and sixth day. One of these was due to the surgeon's self-acknowledged fault in postponing nourishment too long. The *post-mortem* demonstrated the perfect condition of the anastomosis.

For the remaining five deaths of this series, the *post-mortem* revealed the good condition of the abdomen and anastomosis. But the extreme cachexia of the patients seemed to prevent their deriving any benefit from the operation, other than the alleviation of their symptoms, death intervening without complications of any kind; in one case the temperature remaining subnormal during the entire six days of the patient's survival of the operation.

There remain two deaths which were caused by peritonitis. One death in the hands of Jessett. The patient was operated in a common ward, and died ten days later of peritonitis, a septic infection of external origin at the time of operation. The *post-mortem* showed the anastomosis to be in good condition, and the operator accuses himself for this infection, having, in disobe-

dience to his regulations, operated in a room that could not be aseptic.

The other death from peritonitis comes from Senn himself,—a patient operated in December, 1888. The anastomosis was made with dry plates of decalcified bone. The temperature, normal until the fifth day, rose that evening to 101° F. to 104° F. the next morning, resulting in death at noon. “The *post-mortem* revealed a minute perforation at the upper border of the approximation plates.” The dry plates softened by the animal liquids had swollen considerably, adhesions quite firm between the stomach and the intestine. Peritonitis limited to the upper portion of the abdomen.

Since this time only moist plates have been recommended, and have never given rise to such an accident.

Of sixty-one gastro-enterostomies only *one death* has occurred from *insufficient approximation*. This fault was during the experimental stage, before the perfection of the details of the method. The cause of the accident was immediately recognized and corrected; fifty-six operations since the 1st of January, 1889, where moist plates were used, have not once revealed a fault of approximation.

No method of suture ever gave such a remarkable result.

Billroth's statistics of gastro-enterostomy, published in 1891, give 28 operations, 14 deaths; mortality 50 per cent. More than double that of Senn's method in the hands of 34 *different operators*, many of them trying the approximation for the first time.

The statistics of Von Hacker, published in 1890, correspond closely with Billroth's,—21 cases; 8 operated by Wolfler's method resulted in 4 deaths; mortality 50 per cent.; 13 operated by Von Hacker's method resulted in 6 deaths; mortality 47 per cent.

*Results of Successful Operations.*—Forty-seven patients survived the operation of gastro-enterostomy with absorbable plates, a percentage of 77.05. Twenty of these patients are noted at various times as well and no indication of their death can be found.

A patient operated by Jessett the 12th of April, 1890, is

reported four years later in good health (personal letter). The oldest patient of the series (reported by Senn), operated at seventy-one years of age, survived the intervention 20 months.

Twenty-six of the reported cases, which note the length of survival, give an average of four months. Nine of these patients died of particular complications. One (Morison) died suddenly of syncope on the eighth day following the operation. The *post-mortem* revealed the perfect condition of the parts operated upon, no pathological explanation of the death was found. Two cases terminated fatally, on the fourteenth day (Senn) and during the seventh week (Butz) from haemorrhage of the neoplastic mass. Two cases terminated in acute pneumonia,—Barker at six weeks, Senn, the twelfth day. One died of congestion of the lungs, at the end of a month (Beatson). The *post-mortem* of these cases showed the anastomosis in good condition.

Three died of insufficient alimentation due to obstruction, more or less complete, of the digestive canal. One in three weeks' time (Senn). At the *post-mortem* the anastomosis was found without leakage, but a coil low down on the small intestine had been used for the approximation and united to the stomach, reversing the peristaltic action which caused accumulation of matter in the eliminated coils, the obstruction of the opening into the free intestine, rupture of the over-distended coil resulting in death. This was Senn's third operation and showed the danger of Leucke's advice to seize and anastomose the first coil attainable, regardless of its situation. A *second* died at the end of a month, the surgeon (Clarke) *supposing* an occlusion of the orifice. The symptoms are difficult to explain, the supposed stoppage having appeared suddenly. No *post-mortem* was made, and an unanswered interrogation is all that remains of this case. A *third* terminated fatally five months after operation. This is the case reported by Larkin which excited much discussion in England. The clinical report of the case operated in May, 1891, was published as a complete success. Three months later the patient manifested symptoms of occlusion, and Larkin, imagining a closure of the artificial opening of the stomach, im-

mediately performed a jejunostomy of so little use that the patient refused to maintain the fistula, preferring alimentation by the mouth. Death from progressive marasmus the 26th of October, 1891. The post-mortem showed that the small intestine had passed through the opening made in the omentum in performing the anastomosis, an intestinal occlusion caused by bands had stopped all alimentation of the patient. The orifice of the pylorus was largely permeable, the artificial opening narrowed but also permeable. Evidently the calibre of the two outlets of the stomach was amply sufficient for alimentation. It is probable that the cause of all trouble came from the strangling of the intestine. Larkin refuses to admit this and accuses the narrowing of the artificial opening.

Three cases are reported in which the artificial opening was found completely closed. The case of McFarlane notes without details the death seven months after operation, the post-mortem revealing the complete obliteration of the gastro-intestinal orifice. Hawkins also gives few details, seven months after operation, during which time the symptoms of stenosis had ceased entirely, the patient commenced vomiting and died nineteen days later. The post-mortem revealed a cancerous infiltration of the stomach walls, the duodenum and the pancreas. The report fails to state whether the obliteration of the opening of the anastomosis was caused by the growth or not. Stansfield reports the *third* case. Two months after operation the symptoms recommenced and continued until death, four months after the operation. The post-mortem showed a complete obliteration of the orifice, a cancerous infiltration of the region, with secondary deposits in the liver.

In these three cases it is scarcely probable that the obliteration of the orifice shortened life to any great extent, the infiltration marking so advanced a condition of disease that a long survival could scarcely have been expected.

The narrowing of the opening constitutes the serious and almost unique objection to Senn's method. That this cicatrical retraction is not confined to approximation by plates can be answered with perfect truthfulness, and a case of Mayo Robson's furnishes an apt illustration. The patient, operated the 25th of

June, 1891, for cancer of the pylorus, pylorectomy by method of sutures, recurrence of symptoms of stenosis, and second operation in August, 1891, when the artificial pyloric orifice was found narrowed to an extreme degree, the extremity of the finger inadmissible. Consequently a gastro-enterostomy was made, this time with the use of approximation plates.

The retraction of the orifice is the natural result of the normal contraction of fibrous tissue and cannot be charged to any particular method. To prevent retraction of the artificial opening becoming troublesome is aimed at by Senn and others in their use of larger plates. Mayo Robson proposes the insertion of a decalcified bone tube to assure the separation of the edges of the incised bowel. Both of these suggestions may be of value. Plates can be used of any length and thus obtain enormous openings such as are proposed by Abbe, but these have their inconveniences. It is our opinion that modification will scarcely be needed, the rarity of the accident and its possible occurrence perhaps limited to pathological tissue rendering such precautions unnecessary. It is noteworthy that no case of retracted orifice is reported for anastomosis limited to the intestine. We should prefer to operate taking the risk of subsequent contraction, free to create a second anastomotic opening should the recurrence of the symptoms necessitate such action. It is remarkable that the surgeons who have performed such operations frequently—Senn and Jessett—have had no such accident. Could a supposition of faulty technique be made?

Admitting the contraction as a natural result of cicatrization, Murphy has sought to reduce the amount of contraction to a minimum by shortening the distance separating the approximated surfaces, thus obtaining a limited area of fibrous tissue. To what extent his button realizes this end can be found elsewhere and is not a part of this review.

We have thought that this secondary stricture, analogous to that of the urethra, might result from the same causes, lesion of the mucosa, infection, ulceration, cicatricial reparation, and slow contraction of the fibrous formation. Histological examination in several cases of experimental cicatrization seems to confirm our belief.

Should infection at the point of union hinder the formation of a linear cicatrix, the utility of intestinal asepsis, maintained throughout the cicatrization, would be evident and should be tried.

*Pylorectomy.*—Three operations of pylorectomy have been performed with the aid of approximation plates. Murphy, in his statistical table, only mentions one.

Jessett and Morison followed Senn's advice, after excision of the tumor, closing the ends of the stomach and duodenum with a row of sutures passed through all the coats of these organs, inversion of the stitched ends, and a row of sero-serous sutures added to maintain this position. They then performed a gastro-jejunostomy as described precedingly.

Rawdon pursued another line of conduct. The tumor excised, the upper part of the incised stomach closed with two rows of stitches; by cutting one of the bone plates into circular form he inserted it, perpendicularly to the axis of the bowel, in the cut end of the duodenum, the tunics of the intestine reverted on the plate were fixed there by the plate threads; the second plate inserted in a similar manner in the unclosed portion of the incision of the stomach, the approximation was easily completed, thus accomplishing a terminal gastroduodenostomy,—end-to-end approximation. His success recommends this procedure in cases where a sufficient length of duodenum remains, allowing its juxtaposition to the stomach.

Three operations by three different surgeons, one death, two *still living*.

Jessett reports his patient, operated August 4, 1891, to be in fine health, with no trace of existing malignant disease. (Personal letter.)

One death in three cases would give a mortality of  $33\frac{1}{3}$  per cent. But the peculiar circumstances which accompanied the loss of Morison's patient do not allow the incrimination of the operation. The patient, a man sixty-five years old, operated on March 3, was progressing very favorably until the night of March 6, when he was taken with an attack of dyspnoea accompanied by syncope. Recovering from this, he drank a glass of milk

without any difficulty, said that he had had similar attacks at his home before. The next afternoon he died suddenly, of cardiac syncope, at half-past three.

*Post-mortem.*—All the wounds united and healthy; *no peritonitis*; stomach empty; plates loose; one in the stomach little altered, the other in the ileum two feet from the ileo-cæcal valve, and partly digested. Cause of death not found. *The good condition* of the operated parts and the *favorable progress* of the patient, aside from syncope, justify the assertion that *Senn's method used three times for pyloromy* has *never given rise to an accident attributable to the operation*, and, therefore, rests irreproachable. *No method of sutures can compare with this result.*

*Cholecystenterostomy.*—Chavasse used absorbable plates for a cholecystocolostomy to cure a biliary fistula of long persistence. The operation performed in October, 1891, was a complete success, and this surgeon praises Senn's method as facilitating greatly the anastomosis of the gall-bladder with the colon.

A cholecystocolostomy, instead of an anastomosis of the gall-bladder with the highest part possible of the small intestine, might be severely criticised. The excuse offered by Chavasse, of facility and that the patient was accustomed to the absence of biliary matter in the small intestine, ought not to be considered. Abbe, however, fails to point out its defects in his recent article on the surgery of the gall-bladder.

Mayo Robson used his modified Senn's plates for a cholecystenterostomy for biliary fistula. The patient, a woman, L. P., sixty-five years old, made a complete recovery. Operated on September 21, 1893, she is now in good health.

Two operations with approximation plates applied to the surgery of the gall-bladder give complete success in each case, and both operators point out the advantages of Senn's method.

*Ileo-ileostomy.*—Analyzing the remaining cases where absorbable plates have been used, we find nine cases of ileo-ileostomy after excision of the small intestine: twice for cicatrical stenosis with two successes; once for faecal fistula created for gangrene of strangulated hernia, success; once for traumatic rupture of the intestine, a kick from a horse received in the abdomen, rupture of

the small intestine in three places, excision of thirty-nine inches, the anastomosis was made in contused tissue, which the surgeon declares ought not to have been left in the abdomen, the fatal result was due to the giving away of this bruised intestinal coat, *a fault of too little excision*, not of the approximation.

Five cases of immediate excision for gangrened hernia give three successes and two deaths. The death in one case also resulted from an insufficient excision, for which the surgeon accuses himself, but is partly excused by the desperate condition of the patient at the time of the operation, a condition so desperate, says the surgeon, that any other method than the rapid approximation with absorbable plates would have been impossible without leaving the patient dead on the operating-table. The second death of this series was caused by the faulty inversion of the cut end of intestine, a fault due to the inexperience of the operator.

Nine cases of ileo-ileostomy with three deaths place the mortality at  $33\frac{1}{3}$  per cent.; but this will at once be seen to be due to the *condition in extremis* of the patient, or to the *fault of the operator*, not of the method. Suffice it to recall the great mortality of immediate operation of gangrenous hernia and wounds of the intestine in a condition of shock. No adverse criticism of the plate method could justly be found for these cases of ileo-ileostomy.

*Colocolostomy*.—This operation has twice been done with absorbable plates with complete success. The first was done by Abbe,—an anastomosis of the ascending and transverse colon to alleviate the occlusion of a cancer at the hepatic flexure. The success was a brilliant one, but unfortunate in that it led to the proposition and adoption by the New York school of surgeons of Abbe's catgut rings.<sup>1</sup>

The second colocolostomy, also necessitated by cancerous stenosis, was performed by Allingham with perfect success.

*Ileocolostomy*.—Of this operation we find six cases, four for

<sup>1</sup> The fearful mortality of catgut rings substituted for plates does not appear to be sufficiently known, as surgeons have employed them this year notwithstanding the fact that sixteen reported clinical cases where Abbe's rings were used give twelve deaths, *a mortality of 75 per cent.*!

occlusion caused by a cancer of the colon, one for mechanical obstruction near the cæcum, all five terminating successfully. The sixth operation was for gangrene of a hernia of the large intestine, excision and anastomosis of the large with the small intestine, after extensive ligature of mesenteric arteries, death the sixth day that followed the operation. Post-mortem demonstrated the cause to be a perforation of a coil of small intestine *not interested* in the anastomosis, but due directly to the fault of the surgeon who shut off completely all blood-supply by ligating, paying no attention to the necessity of excision of the coil that he destined to gangrene. The anastomosis in this case was found in perfect condition.

*Excision of Cæcum-Ileocolostomy.*—Cancer of the ileo-cæcal coil has been treated four times by excision and ileocolostomy with absorbable plates. Three of these cases recovered completely in remarkable contrast to the results of the same operation by other methods. The recent complete monograph of Dr. Baillet gives the general mortality of 26 cases of excision of the cæcum by methods other than Senn's, 26 operations for cancer, 14 deaths; mortality, 53.84 per cent. Can a more striking example of the plate method of approximation be found?

Senn reports one case of excision of the cancerous cæcum for chronic invagination, which terminated fatally. Without insisting upon the particular dangers of such cases, dangers well pointed out by Dr. Baillet, we find that in this particular operation the end of the colon insufficiently excised had opened, the stitches not holding in the softening tissues. Death from peritonitis. Here again the fault is acknowledged by the surgeon to be the incomplete excision of the diseased portion. The anastomosis was found in faultless condition.

#### RECAPITULATION.

	Deaths.	General Mortality.
87 operations. . . . .	20	23.10 per cent.
61 gastro-enterostomies. . . . .	14	22.95 "
3 pylorectomies. . . . .	1	33.33 "
2 cholecystenterostomies. . . . .	0	00.00 "
21 anastomosis of intestine only . . . . .	5	23.80 "

Of eighty-seven operations, only one death can be attributed to the plate method, and this in the hands of the inventor, occurred from the use of dry plates in the experimental stage of this operation. Since that accident and the correction of its cause, not a single fault of approximation is found in the clinical reports.

The survivors of the other intestinal operations by Senn's method are, as far as can be learned, in actual good health.

The plates have generally been absorbed, sometimes eliminated in fragments, never having caused any trouble. The silk threads used in attaching the plates are found *in situ*, in almost every post-mortem, embedded in the tissue and unaltered, which has led to the substitution of catgut by some surgeons, the reason for which is scarcely understood, as no accident has occurred due to the presence of the threads, and silk has a decided advantage over catgut in tying, and is much easier to sterilize and preserve.

The rapidity of operation with absorbable plates is remarkable, a gastro-enterostomy in experienced hands requiring from twenty to thirty minutes only, according to clinical reports. It would seem that this vantage point has not been sufficiently insisted upon.

#### CONCLUSIONS.

The superiority of visceral approximation with absorbable plates is clinically established when compared with methods of suture, and should cause their rejection.

The rapidity of plate approximation makes a different operation of pylorectomy than when it was performed with sutures. Its possibilities are therefore much greater.

The successes of this operation by Senn's method, the different prognosis for the survivors should push the surgeon to pylorectomy rather than to gastro-enterostomy.

The brilliant results of Senn's method have changed the indications of treatment of visceral stenosis. The safety of operation is *assured*. The duty of the physician to give his patient the benefit of an operation becomes imperative. The family doc-

tor is responsible for the delivery of the case to the surgeon in such time that the patient's condition be good enough to strike out of subsequent statistics all deaths from "shock" and "marasmus," that the mortality of visceral approximation for cancer be reduced to zero.

Appended are statistical and bibliographical tables.

A complete bibliography of the experimentation, statistical discussion, and technique of Senn's methods was published in the inaugural thesis of the author, and will not be reproduced here, as it would be of little interest to the general reader.

#### GASTRO-ENTEROSTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Allingham	W. 47	5 mos.	...	Died from progress of disease.
Atkinson	W. 45	...	...	Left hospital at end of one month.
Battle	?	4 mos.	...	Died from progress of disease.
Barker	M. 55	1½ mos.	...	" " acute pneumonia.
Beatson	M. 45	...	4 days	" " inanition.
"	W. 58	1 mo.	...	" " congestion of the lungs.
Bennett	M. 52	Well	...	
Brown	W. 56	4 mos.	...	" " progress of disease.
Butz	M. 35	1½ mos.	...	" " haemorrhagia of the tumor.
"	M. 49	...	3 days	
Clarke	M. 48	Well	...	Reported well ten months later.
"	W. 36	1 mo.	...	<i>Supposed</i> occlusion of the orifice.
Fenger	?	Success	...	No other details.
Hawkins	M. 45	7 mos.	...	Death. Post-mortem shows orifice completely closed.
Heigl	?	Success	...	
Hester	M. 36	...	25 hours	Operated <i>in extremis</i> .
Hoegh	M. 43	Well	...	
Hume	M. 53	2 mos.	...	Died from progress of disease.
Hunter	?	Success	...	
Jessett	M. 61	...	4 days	Cachexia. Anastomosis in perfect condition.
"	W. 56	Well	...	In good health four years after operation.
"	W. 45	9 mos.	...	Died from progress of disease.
"	M. 67	...	10 days	Peritonitis, external infection, anastomosis perfect.
"	M. 52	Well	...	
"	W. 42	"	...	
"	W. 53	...	Died	No details.
"	M. 51	Well	...	
Larkin	W. 47	5 mos.	...	See discussion of this case.
McFarlane	M. 36	7 mos.	...	" "
Mansell-				
Moullin	M. 20	1½ mos.	...	Died; cachexia. Anastomosis perfect.

## GASTRO-ENTEROSTOMY.—Concluded.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Mansell- Moullin	W. 35	...	6 days	Temperature subnormal until death.
Morison	M. 31	8 days	...	Syncope. Post-mortem reveals good condition.
Paul	W. 48	1 mo.	...	
Purcell	W. 44	Well	...	Left the hospital at the end of a month.
Ramsay	W. 47	"	...	Left the hospital at the end of a month.
"	M. 44	"	...	
Ransohoff	M. 37	"	...	
Renton	W. 38	"	...	Reported in good health eight months later.
"	M. 47	"	...	
Robson	M. ?	...	3 days	Cachexia too advanced to permit recovery.
"	W. 27	3 mos.	...	Died from progress of the disease.
"	M. ?	3 weeks	...	Anastomosis in perfect condition.
Russell		Success	...	
Ruth	M. 58	...	12 hours	Operated <i>in extremis</i> .
Senn	M. 65	...	5 days	Marasmus. Anastomosis perfect.
"	M. 47	3½ mos.	...	Progress of disease.
"	M. 35	3 weeks	...	Low anastomosis, stoppage causing death.
"	M. 43	4 mos.	...	
"	M. 38	...	5 days	Dry plates, perforation, peritonitis, death.
"	M. 69	...	2 hours	Operated <i>in extremis</i> .
"	M. 32	14 days	...	Hæmorrhagia of the tumor.
"	W. 45	12 "	...	Acute pneumonia (epidemic of "La Gripe").
"	M. 71	20 mos.	...	Progress of disease.
"	M. 37	...	5 hours	Shock.
"	M. 45	18 days	...	Cachexia too advanced.
"	M. 35	3 mos.	...	
"	M. 44	...	8 hours	Operated <i>in extremis</i> .
Stamm	W. 63	5 weeks	...	Rapid progress of disease.
Stansfield	M. 53	4 mos.	...	Orifice of anastomosis closed.
Taylor	M. 56	Well	...	Left the hospital after six weeks.
Von Baraçz	M. 60	"	...	

## PYLORECTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Jessett	W. 38	Well	...	Reported well four years later.
Morison	M. 65	...	4 days	Cardiac syncope.
Rawdon	M. 56	Well	...	

## CHOLECYSTENTEROSTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Chavasse	M. 47	Well	. . . .	To cure biliary fistula.
Robson	W. 65	"	. . . .	To cure biliary fistula

## ILEO-ILEOSTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Battle	M. 24	. . . .	3 days	Insufficient resection of gangrenal hernia.
Graff	W. 58	Well	. . . .	
"	W. 40	"		
"	W. 50	. . . .	4 days	Faulty invagination to close the end of gut.
Homans	W. 10	Well	. . . .	
Lane	W. 53	"	. . . .	
"	W. 55	. . . .	5 days	Insufficient excision of gangrenal intestine.
Russell	M. 15	Well	. . . .	
Wright	M. 56	"	. . . .	

## ILEOCOLOSTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Atkinson	M. 22	Well	. . . .	
Barling	?	. . . .	6 days	Extensive ligation, gangrene of intestine.
Elliot	M. 60	Well	. . . .	
Ilott	W. 50	"	. . . .	
Lawson	M. 40	"	. . . .	
Littlewood	M. 35	"	. . . .	
Morison	M. 57	2½ mos.	. . . .	Died of bronchitis, otherwise in good health.
Robson	M. 56	Well	. . . .	
Senn	M. 37	"	. . . .	
"	W. 53	. . . .	6 days	Insufficient excision of invaginated intestine.

## COLOCOLOSTOMY.

Surgeon.	Sex. Age.	Survival.	Time from Operation to Death.	Remarks.
Abbe	M. 60	Well	· · · ·	
Allingham	M. 30	"	· · · ·	

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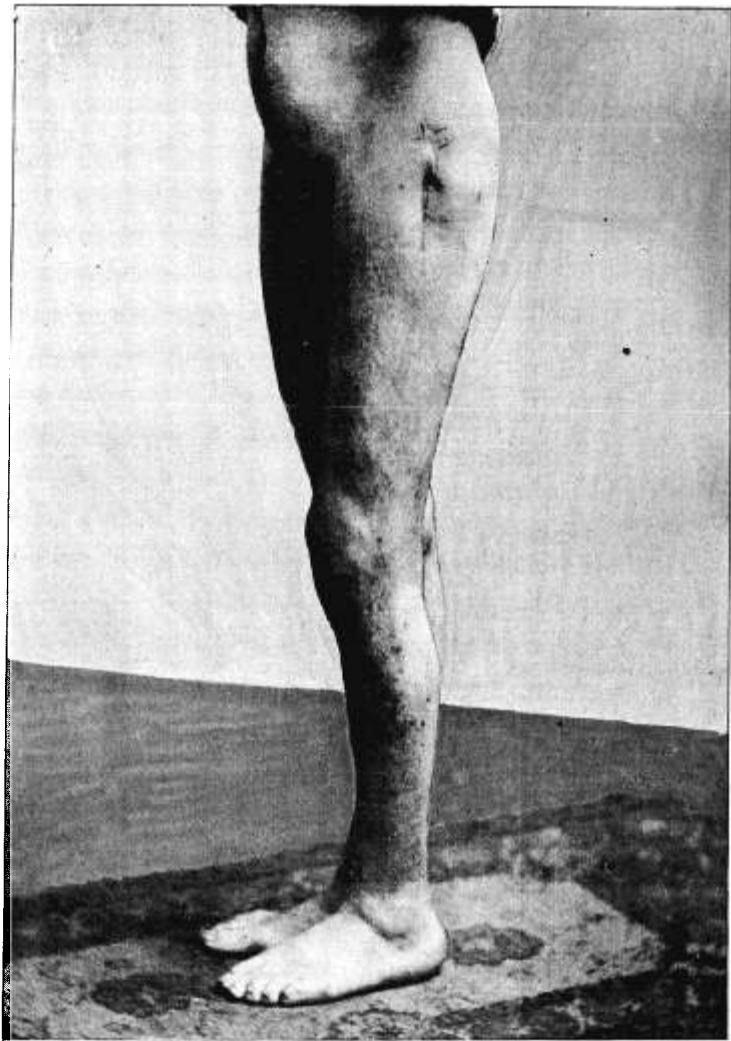
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